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AUTHOR Daines, Delva
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ABSTRACT

The basic philosophy of mastery learning is that all students can learn if they are provided with effective instruction and practice. Research on mastery learning has been done in many countries and at all levels of education in different subject areas, and it has repeatedly shown excellent results. This teaching and learning strategy succeeds in bringing large proportions of students to high levels of achievement with good retention and with strong motivation for learning. The three major elements in mastery learning are preparation for teaching, the instructional processes, and the evaluation of students' learning. Preparation consists of writing and sequencing program objectives and determining instructional reading levels of students. Instructional processes include stating the instructional objective explicitly, modeling the skill for the students, eliciting a replication of the model through the use of instructional directions and questions, providing immediate feedback to the students through reinforcement or corrective procedures, and planning and supervising their practice activities. The feedback and correction procedures are the most essential aspect of a mastery learning model. Evaluation for mastery learning includes formative and summative tests, although emphasis is placed on formative evaluation because constant diagnosis is made of what has been learned by the students, and correction is provided until mastery of the skill has been achieved. A 34-item checklist for designing a mastery learning program is appended as well as a bibliography of 69 references. (JD)

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Delva Daines

Professor of Education

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DESIGNING INSTRUCTION FOR MASTERY LEARNING

Delva Daines, Professor of Education
Brigham Young University
Provo, Utah 84602

Mastery learning refers to efficient teaching and learning activities designed to assist students in mastering school learning. Models of mastery learning result in higher achievement for nearly all students, and it is postulated herein that students can attain to higher levels of learning when teachers maintain high levels of expectations of all their students and actively involve the students in the prescribed learning activities.

Philosophy of Mastery Learning

In Carroll's (1963) theory of school learning he explained the typical distribution of school outcomes in terms of learning rates rather than innate learning limits by defining aptitude as a measure of learning rate or as the amount of time students need to attain mastery of a learning task. Carroll further believed that in a school setting the time spent and the time needed to master a task are influenced by both the characteristics of the students and the characteristics of the instruction. Carroll hypothesized that if students receive quality instruction, are allowed to spend the time they need to learn a task, and persevere and use the available time, they should be able to reach the required level of achievement.

By contrast, Bloom (1976) proposed the idea that the students' involvement in learning is a major factor in their mastery of school tasks. Such involvement relies on the students' having the prerequisite or cognitive entry behavior to learn a specific task, possessing the motivation to learn, and engaging in active participation in the instructional processes relevant to the learning task. The involvement of students increases when instruction processes and procedures

link their behaviors to a learning task. Instructional cues or directives given by a teacher increase the involvement of students in learning a skill, which in turn increases their achievement (Levin and Long, 1981).

Bloom (1976 and 1981) viewed instruction and learning in terms of specific instructional objectives, materials, and practices. He recommended that each subject taught in school consist of a set of instructional objectives organized into a logical sequence and grouped according to a unit of time and material. Bloom further explained that in a conventional classroom a teacher presents fairly homogeneous instruction to all students, coupled with a uniform amount of practice and a constant amount of learning time. Under these conditions, some students make learning errors that compound over a period of time. They find it difficult to persevere under these circumstances, and the affective aspect of learning becomes negative. These factors increase the individual differences among students.

The alternative to conventional instruction is mastery learning. Bloom (1981) stated that perhaps more than 90 percent of the students can master subject matter if they receive quality instruction and sufficient practice. The students, then, become very similar with regard to learning ability, rate of learning, and motivation for further learning. Students taught with this method evidence high levels of cognitive achievement and retention and perform well on higher mental processes (Block and Burns, 1977; Block, 1979; and Bloom, 1976, 1978, and 1981). About 80 to 100 percent of the students in classes utilizing the mastery strategy reach the same final criterion of achievement as do the top 15 to 20 percent of a class taught by nonmastery approaches (Block and Burns, 1977; Bloom, 1981; Burns, 1979; Hyman and Cohen, 1979; and Reid, 1974). Furthermore, elementary and secondary school students, students from different cultural and socio-economic groups, and fast and slow

learning students all obtain high levels of achievement when using approaches to mastery learning (Abrams, 1979; Barber, 1979; Burns, 1979; Cooke, 1979; Geisert, 1979; Katims, 1979; Kulik, Kulik, and Cohen, 1979, Katims and Jones, 1981; and Reid, 1974).

Clearly, then, teacher expectations and student involvement are of tremendous importance. The expectations teachers and principals hold for students are directly related to student achievement. In schools where the attainment of learning is found to be improving, it is obvious that teachers expect all students to have high achievements, while in schools where learning attainment is declining, the teachers expected only a few students to achieve (Brookover and Lezotte, 1977). Mahan and Mahan (1971) found that the average ability scores of inner-city youths who were placed in high achieving classrooms increased significantly more than the scores of those students placed in low-achieving classrooms. Improving the achievement level of inner-city youths was considered to be dependent on changing their social and learning environment rather than trying to remediate the deficiencies of the individual students. Other research indicates that schools with predominantly low-achieving students are characterized by low expectations and practices on the part of teachers who expect and accept low level of achievements as appropriate for their students (Brookover, Beady, Flood, Schweitzer, and Wisenbaker, 1979; Brookover and Schneider, 1975; and Rutter, Maughan, Mortimore, and Ouston, 1979). Teachers need to believe their students can learn at mastery levels, and they need to provide effective classroom instruction that allows for the students to be actively involved.

Preparing for Mastery Learning

Before teachers can design instruction that will help students to master school learning, it is necessary for them to identify the objectives of their curricula and to determine the instructional reading levels of students. A

list of curricular objectives helps to define the essential content to be learned and what the students are expected to be able to do with the content. The selection of books and materials appropriate for the students is based on the information about the instructional reading levels of students. Information about instructional objectives and reading levels is presented in this section.

Instructional Objectives

A curricula consists of goals, objectives, content, and the prescribed learning activities and materials. A list of curricular objectives establishes the skills and concepts considered essential for teaching and learning. In a mastery approach to learning the instructional goals are identified and sequenced so that each objective builds on the one that precedes it and, in turn, serves as a prerequisite to those that follow. The sequenced objectives are grouped into meaningful units, and each unit is designated as representing different levels in progress. Such a list of objectives provides a blueprint for teaching and testing (Abrams, 1979; and Katims and Jones, 1981).

Mastery is, as has been stated, learner oriented. When students demonstrate the mastery of an objective, a closure point is reached, forcing a forward movement in the curriculum (Hyman and Cohen, 1979). This form of instructional programming necessitates that the teacher accept and use performance objectives and that students be tested for mastery learning of the specified skills and concepts. Thus, curricular objectives are to be specified and mastery tests prepared before instruction begins (Abrams, 1979; and Hannon and Katims, 1979).

An approach to mastery learning can be used by teachers without making alterations to existing curricula and texts (Bloom, 1981). Sequenced units of objectives provide a teacher with information about the order of teaching skills and concepts, and establishes the criteria for performance levels for students to master. The attainment of mastery by students is enhanced when a teacher

accepts the responsibility for approving the objectives of a curricula and presents appropriate instruction.

These instructional objectives should certainly include the higher thinking skills. Many years ago Bloom and his associates (1956) developed a taxonomy or classification system of the cognitive domain in order to identify the levels of thinking expected of students. Utilizing this taxonomy makes it possible for teachers to develop school activities and assignments at higher thinking levels. The six categories of thinking (knowledge, comprehension, application, analysis, synthesis, and evaluation) supply a framework for teachers as they write objectives and design questions and activities to extend the thinking of students beyond the knowledge level to the level where they analyze and solve problems. Students need to develop confidence in their ability.

Although Bloom's taxonomy is very useful, any other classification scheme can be followed to assist teachers in using a wide array of learning outcomes at higher thinking levels. But classification of objectives is essential in the sequencing and planning of instruction, and in designing instruction effectively (Gagné, 1977).

Instructional Reading Level

A wide range of reading performance levels exist among students within any classroom. If students are to perform at their highest level, it is necessary for teachers to provide instruction aimed at their individual needs. Therefore, students' instructional reading levels should be determined by teachers early in the school year. This information can assist a teacher in providing them with material they can read and understand and in forming instructional groups.

There are many different procedures used to determine the instructional reading levels of students. At the middle and secondary school levels the

cloze procedure is often used with content area materials. At the elementary school level the most widely used technique for assessing students' instructional reading levels is an informal reading inventory or placement test. Informal reading inventories are available commercially and through publishers of reading programs. An informal reading inventory (IRI) provides the teacher with a way of observing students while they process prose from graded materials and with a way to determine the most appropriate level of materials to be used for the students' reading instruction. The levels of reading competency determined by using an IRI are on a continuum from a level that is easy for students to read, to the level at which it is most profitable for the readers to receive instruction, to the level that is frustrating and too difficult for the students (Farr and Roser, 1979; and Harris and Sipay, 1980).

The instructional reading level is considered to be the level of materials at which a student can profitably read. This means that the material is difficult enough to provide a challenge and that it necessitates some instruction without causing frustration for the reader. A student "should encounter no more difficulty than can reasonably be expected to overcome through good instruction" (Johnson and Kress 1965 p. 9). This implies that a student can read the selection at an improved independent level after receiving instruction from the teacher.

In mastery learning the teacher is to provide reading instruction at the students' instructional levels. Students are grouped according to their instructional reading levels and are instructed in the reading skills they will need in future work. Students advance in their reading as they demonstrate mastery of reading skills. Each student progresses independently of other students in his practice of new skills and work in assigned materials. Teacher instruction, however, continues with small groups of students based on their instructional reading levels (Katims and Jones, 1981; and Reid 1980).

Instructional Processes

Teacher behavior remains a significant factor in students' learning, regardless of the approach used to mastery learning. It is what teachers do in interacting with their students that influences what students learn and how they feel about learning and about themselves. Teachers using instruction for mastery learning have high achievement expectations of their students (80 to 100 percent). This necessitates teacher involvement during the instruction and practice activities.

The mastery learning process is implemented by teachers using a series of instructional cues or procedures intended to result in students' reaching the desired mastery level stated in the objectives of the curricula. The instructional processes include the following five procedures:

1. Orienting the students to the lesson objective.
2. Modeling the skill the students are to learn.
3. Directing the students to replicate the model frequently and in a short duration of time.
4. Correcting mistakes and modeling again if students do not respond or respond incorrectly to teacher instructional directives and questions.
5. Planning activities to help the students to practice and master the newly learned skill.

All of the above processes include both students and teacher involvement. If instructional processes elicit behavior relevant to the learning task, then the involvement of students is likely to increase greatly. Active involvement is a major learning factor. Thus, teacher directives and explanations have the potential to increase or decrease students' involvement in learning (Bloom, 1981; Chadwick and Day, 1971; and Packard, 1970).

Orienting Students

The students' motivation is considered a key to increasing the quality and quantity of their learning. Orienting or informing students what they are to

learn in a lesson helps them to establish an idea of what they are to work toward and a motivation to participate in the learning activities. The instructional objectives are given directly to students, who are made aware of the exact behaviors desired of them and the conditions under which the behaviors are to be learned. Instead of guessing what is expected of them, they can then devote their energies to acquiring the behaviors specified by the teacher. This orienting process gives students a sense of security.

Instructional objectives are designed to describe the processes that students are expected to acquire, and objectives that are given to the students before teacher instruction serve as orienting stimuli (Duchastel and Brown 1974). Students who are given information about instructional objectives prior to the learning activity remember the material better than the students who do not receive such information (Duchastel and Brown, 1974; Gagné and Rothkopf, 1975; Rothkopf and Kaplan, 1972; and Royer, 1977). The incentives of students for learning are increased when they are required to master learning objectives. By contrast, when students are asked only to do their best, they generally set low performance goals that are below their maximum capabilities (La Porte and Nath 1976). Effective instructional objectives need to be clear, uncomplicated, and stated prior to teacher instruction (Levin and Long 1981).

Modeling a Skill

Students learn much of their behavior by observing and imitating the behavior of other people (Bandura 1969). This phenomenon is called modeling and leads to the development of new behaviors. In an instructional setting, modeling, or teaching the skill to be learned, is used in conjunction with reinforcement procedures to generate desired behavioral changes. Modeling is a system of demonstrating, imitating, and processing information and action. The teacher serves as the paradigm for the students to follow, and instructional

objectives are more effective if they are consistent with the behavior modeled by the teacher. Modeling a clearly stated objective gives students an understanding of what and how they are to perform. Students are concerned about their progress in school learning; and, given the opportunity, they will share responsibility for their learning (Naylor 1974).

The clarity and brevity of the modeling processes are essential for involving students in learning. The teacher model should be the direct teaching of the defined behavior stated in the instructional objective, and the students should not experience any doubts about teacher expectations. The modeling focuses on a group mode of instruction, and students are asked to learn the same skill or information at the same level of mastery. Instead of competition this process of group-based instruction fosters cooperative behavior and mutual assistance among students as they replicate the teacher model and practice the new skill. Each skill lesson begins with the teacher stating an objective and modeling it for the students (Bloom 1981 and Block 1979). The teacher's greatest contribution to this process of modeling lies in his ability to demonstrate good form and to furnish necessary correction to any incorrect form replicated by students (Woodruff 1951).

Replicating the Teacher Model

After a teacher has stated a lesson objective and modeled the skill, the students are directed to repeat the model. These motivational variables energize and expedite the learning process. An essential factor is that "through such motivational effects as mobilization of effort and persistence, more repetitions of the material can be completed within a stipulated learning time, and each repetition will be conducted more effectively" (Ausubel and Robinson, 1969, p. 365).

It is the teacher's function to provide the conditions or modeling that serves as a pattern for the students to replicate. After the correct form is

established the students should have multiple practice, both timed and untimed to help them secure fast, accurate and automatic behavior. A major reason for the repetitive structure of modeling and teacher directives is to develop, strengthen, and reinforce the students' correct responses (Wadham, 1972).

During the modeling process, the teacher gives directives to elicit oral and written responses from the students. Students increase their accuracy, comprehension, and retention of information when their responses are given in simultaneous unison. If students do not respond or if they give incorrect responses, the teacher models the skill again (Reid, 1981). In the proofing step of a replicated model by the students, the teacher provides a written model of the dictated item against which each student can check his own response.

Oral or written responses to teacher directives or questions increase students' participation that can be observed, and the teacher monitors these responses of the students. Reinforcement is given for correct responses, and incorrect responses are corrected by the teacher remodeling the skill, accompanied by directives to guide the student in his responses. This careful monitoring, diagnosis, and prescription for the incorrect responses of students prevents the practice of bad form (Wadham, 1972).

"When a behavior is immediately followed by a positive reinforcer, that behavior is strengthened and will occur more frequently" (Hunter, 1981, p. 12). The important factor is the immediacy of the reinforcer. After students establish the correct form, multiple timed practice is given to establish fast, accurate, automatic behavior. However, attention should first focus on form, then stress should be given to form and speed (Woodruff, 1951).

A major reason for the repetitive structure of the dictation procedure is to develop strength and to reinforce the good response habits. Incorrect responses are resistent to change and should be avoided. A correct model is especially important to young children who are beginning readers (Durkin, 1980; Wadham, 1972: and Woodruff, 1951).

In a mastery learning classroom, emphasis is placed on the utilization of time for teacher and students' responses. Because of these many opportunities for oral and written responses by students, a teacher is required to do more monitoring. It is easier to prevent incorrect learning responses than to remediate (Dechant, 1981).

Feedback and Corrective Procedures

The stated objective and teacher's model present to the students the skill and level of performance they are to achieve. Overt responses are easily observed by the teacher and student, whereas ideational responses are difficult to monitor. Attention is sustained by using overt responses (Monroe, 1932). As students respond to teacher directives, the teacher reinforces their correct responses and corrects their incorrect responses. Feedback is a two-way process. Students provide cues about their understanding of a skill or information through their overt responses, both oral and written. Teachers observe these responses and provide feedback to the students to let them know how well they are doing in learning the specified skill. The feedback is in the form of positive reinforcement for correct responses. For those students that make incorrect responses, the teacher corrects the responses, remodels the skill, and elicits correct answers. Effective feedback informs students whether they have met the standard or what they still must do to reach it.

Feedback and corrective procedures are a major part of mastery learning. The procedures used by a teacher are based on the empirical evidence presented by the students. All feedback and corrective procedures need to be specific and distinct (Bloom, 1981; and Levin and Long, 1981). Feedback and corrective procedures are more relevant and effective if they are given to the students immediately after their responses occur. A teacher should identify and evaluate the responses of students instantly and then diagnose and prescribe for

incorrect responses. Prompt feedback and practice help students to learn correct form and not to practice errors (Guthrie, 1971). Timing is crucial to the effective use of feedback, and teachers should provide feedback to students when they are in the process of learning the new skill rather than waiting until the end of a unit or a semester. However, correcting errors is useful only if the teacher points out ways in which the students can correct them (Levin and Long, 1981). This monitoring procedure also helps a teacher to assess his own instructional cues and to improve subsequent teaching (Farr and Brown, 1971).

Feedback is also provided to students at the end of learning units. The information is obtained through the use of short formative tests, and students are expected to relearn any information or skills they have forgotten (Bloom, 1981; and Block and Anderson, 1975). Formative and summative evaluation are discussed in another section of this paper.

Rate of Responses

Rate is a vital factor in teaching and learning. Once skills have been mastered they can be increased by building rate. But accuracy must always precede rate. Rate is considered a basic measure of performance (Skinner, 1953; Bijou, Peterson, and Marion, 1968; and Reid, 1974). Students' response behavior is a measure of rate, and by increasing the required task students can effect an increase in rate.

Group-based instruction discourages procrastination. Teacher pacing keeps students involved with the material to be learned, and it is the active time spent in learning that is the most powerful predictors of their actual achievement according to Block (Brandt, 1976). Eliciting rapid responses from students is the most common way of increasing their participation.

Students respond more frequently and of shorter duration when they use group responding techniques (Scheen, 1972). When students considered to be of "low ability" responded to teacher directives at high rates they learned quickly. In this study some first grade children received additional instruction in a sequenced program to compensate for experiences missed in their homes and kindergarten. However, when their rates of response increased and they mastered the material, the differences in the way they and other students used their time diminished (Winterton, 1971).

A teacher should get all their students responding to the material presented. The great individual differences among students is the point at which they begin to learn; but once they begin, they learn at fundamentally the same rates (Block, 1974 and 1979; Bloom, 1978 and 1981; Brandt, 1976; and Levin and Long, 1981). Students who acquire the necessary prerequisite or entry behaviors are better able to understand the instruction and become more involved in learning (Bloom, 1976 and 1981). Students who have reading and spelling difficulty need to use oral and kinesthetic responses instead of ideational ones (Chall, 1968).

Not allowing students to postpone their learning and eliciting from them rapid overt oral and written responses are essential instructional procedures in learning new skills and concepts. Teacher directives and modeling serve as the base for such responses. After a good model has been provided, students can respond frequently and at the same rapid rate. The rapid repetitive structure "is to develop, strengthen and reinforce good response habits" (Wadham, 1972, p. 26). In an inservice program teachers learned to increase the time they allowed for modeling behavior and to monitor the responses of students and give reinforcement to their correct responses. These procedures influenced the rate and number of correct responses by the students (Wadham,

1972). In another study in which some teachers used similar instructional cues, their students had a high frequency of correct responses that took less time, and they had few off-task or inaccurate behaviors. The teachers checked the students' responses more frequently and used less time per check, they instructed and modeled more frequently, and they reinforced the correct responses of their students more consistently (Wadham, Young, and Rencher, 1976).

Practice Time

Practice time is when students, under teacher supervision, exert effort toward their individual mastery of a skill or new information. It is an important part of mastery learning. As students work, a teacher confers with individual students, assists, tests, and, when necessary, does instant error correction and reteaches the skill. When reteaching is provided, the teacher uses different examples and materials than those employed in group instruction. All conference and test data should be recorded on students' record forms. This information is used by the teacher to plan teaching and learning activities. The time allotted for the practice is longer than the instructional time when a teacher models the new skill and when students respond to the directives of a teacher.

When a teacher is giving instruction to a group of students, the other students are at their desks doing assigned activities. Following instruction for new skills, all the students, individually or in small groups, practice for mastery. They prepare themselves to be ready for their mastery tests. A student partner system or groups of two or three students working together help to motivate them to do corrective work, and provides the assistance and time students need to learn the new skills (Bloom, 1981 and Brandt 1976). During the practice time, a teacher confers with individual students, reteaches

when necessary, conducts discussions, and administers mastery tests. It is necessary to plan the practice time activities so that students know what they are to do and so that they become independent in their work habits. In teaching students to achieve their goals it is necessary to teach what is expected of them. It is usually necessary to have a short period of training in which all students work together, in a lockstep fashion, to learn necessary procedures. As soon as students learn to be independent and know what is expected of them, practice time is conducted on a cooperative basis. Students then practice at their own pace on different activities. Such techniques provide for the individual needs of students and allow for skill learning in a group setting since students respond more rapidly in groups than in a tutorial situation.

Practice is necessary if form and speed are to be improved (Woodruff, 1951). Learning materials and activities should allow students to practice the skills on which they will be evaluated on mastery tests. The demand for persistence or perseverance in a task is greatly reduced if students are provided with the instructional materials considered most appropriate for them (Katims, 1979; and Katims and Jones, 1981). These learning activities and teacher questions should be organized to include the higher thinking processes so as to facilitate higher levels of comprehension (Daines, 1982; and Katims and Jones, 1981). The percentage of clock time the students spend in prescribed learning activities, or time on task, determines their mastery of a skill or information (Anderson, 1976; Block, 1974 and 1979; Bloom, 1976, 1978, 1981; Carroll, 1963; Goodlad, 1979; Hyman and Cohen, 1979; Katims, 1979; Levin and Long, 1981; Katims and Jones, 1981; and Rosenshine, 1979).

Evaluation of Student Learning

Evaluation is a process used for making improvements in curricula, instruction, and students' learning by determining the extent to which the

objectives are actually being attained. The prime purpose of evaluation is to monitor the progress and ultimate achievement of students in school learning tasks and to monitor the effectiveness of instruction.

Objectives establish what is to be accomplished. The objectives of a course or program are to clearly state the content and skills students are to learn, and they become the design for planning instructional strategies and the evaluation procedures. The instructional and evaluation processes must be in harmony with the objectives.

Formative and summative evaluations are used in mastery learning classrooms. Formative evaluations are used to check the progress of students in learning tasks. Summative evaluation is used to determine the degree students have reached the objectives of an instructional program. A discussion of these procedures is presented.

Formative Evaluation

Mastery learning is considered a natural product of efficient instruction and prescribed learning activities. Fundamental to mastery learning is the use of feedback and corrective procedures. The most vital time to use these processes is during the initial instruction of a skill. Using correction procedures at this time lessens the total amount of time required for students to master new skills and information. "Since formative evaluation takes place during the formative stage, every effort should be made to use it to improve the process" (Bloom, Hastings, and Madaus, 1971, p. 117).

Use of formative tests is effective in providing feedback to students about their progress in learning and to teachers about their instructional procedures. Since a formative test is not a test of terminal performance, students should be provided with immediate feedback, correction, and activities that may lead to overcoming their deficiencies in performance (Airasian, 1971; and Duchastel and

Merrill, 1973). Students learn more rapidly and reach higher levels of achievement when they are provided with knowledge of their performance. Constant feedback and correction relevant to students' needs help to ensure the mastery of skills before they start subsequent tasks (Ammons, 1956; Block, 1971; Bloom, Hastings, and Madaus, 1971; Bloom, 1981; and Katims and Jones, 1981).

Tests used to monitor students' learning should reflect program objectives and are to be given at frequent intervals. When objectives specify the learning of higher cognitive processes, the test must provide opportunities for students to demonstrate those skills. If teachers are to influence learning outcomes, they should formulate clear objectives, communicate the objectives explicitly to students, provide instruction geared to the objectives, and construct measuring instruments that test the degree to which these objectives are realized.

Since formative tests are for diagnostic purposes and focus on the kind of errors made, they are given frequently during a learning unit. A unit of learning is larger than a single instructional session or lesson and consists of skills or subject matter to be learned over a period of time. The instructional material is broken down into its components, the standard of achievement is determined, and these factors determine the content and nature of the test (Block and Anderson, 1975; Bloom, Hastings, and Madaus, 1971; and Bloom, 1981). Criterion-referenced tests are designed to assess whether students have achieved mastery of a specific skill or performance standard specified in the objectives at a predetermined level of proficiency. Criteria for passing mastery tests are identical for all students regardless of their instructional reading levels. This procedure helps students to increase their self-confidence. Criterion-referenced tests can be used (1) for preassessment purposes, (2) for testing concurrently with instruction to check progress of students so correction can be given when necessary, (3) at the end of a unit, and (4) to determine if instruction

components need modification (Airasian and Madaus, 1972; and Bloom, Hastings, and Madaus, 1971).

In designing a formative test three factors are essential. The first step is to prepare the instructional objectives prior to instruction. A taxonomy provides a guideline in specifying higher thinking skills (analysis, synthesis, valuing, etc.) instead of overemphasizing performance goals at the lower or literal level (Bloom 1981). Second is a task analysis technique. This is accomplished by asking what a student must know in order to learn a skill or unit of instruction and work "downward" to the specific behaviors. The results of the task analysis are arranged in a hierarchy, with the terminal objective in the top position and the entry behaviors in the bottom position (Gagné, 1977). Third is the selection of appropriate procedures to assess mastery learning. Suitable procedures are determined by the nature of the skill or competency specified. Written and oral tests are used most often.

Summative Tests

Summative tests are used at the end of a term or course to evaluate the progress of students, to inform them of their achievements, and to determine grades for their work. By using mastery teaching and learning techniques, 90 percent or more of the students can achieve mastery. However, if formative tests are carefully developed and used at frequent intervals, summative tests are not necessary, except as a report or external audit. The reason is because formative tests indicate to the students and teacher what has been mastered and what has been missed; thus, the teacher can provide immediate corrective procedures and the students can correct their mistakes (Bloom, 1981; and Cox, 1979).

Summative tests are directed more toward larger outcomes than those found in formative evaluation. Application of skills and information is the focus of this type of test, and accuracy of performance is expected. The procedures

must be related to what was taught and how it was taught. Judgments are made and evaluations of progress or grades are given. Usually, however, tests for summative purposes are given every few weeks for younger children or several times during a course for older students (Bloom, Hastings, and Madaus, 1971; and Bloom, 1981).

Summary

The basic philosophy of mastery learning is that all students can learn if they are provided with quality instruction and practice. Research on mastery learning has been done in many countries and at all levels of education in different subject areas, and it has repeatedly shown excellent results. This teaching and learning strategy succeeds in bringing large proportions of students to high levels of achievement with good retention and with strong motivation for learning.

There are three major elements in learning for mastery. They are the preparation for teaching, the instructional processes, and the evaluation of students' learning. Preparation consists of writing and sequencing program objectives and of determining instructional reading levels of students. Instruction by the teacher includes stating the instructional objective explicitly and modeling the skill for the students, eliciting from them a replication of the model through the use of instructional directions and questions, providing immediate feedback to the students through reinforcement or corrective procedures, and planning and supervising their practice activities. The feedback and correction procedures are the most essential aspect of a mastery learning model. Teachers use less time to instruct and let students respond more frequently. Evaluation for mastery learning includes formative and summative tests. Emphasis is placed on formative evaluation because constant

diagnosis is made of what has been learned by the students, and correction is provided until mastery of the skill has been achieved.

DESIGNING INSTRUCTION FOR MASTERY LEARNING CHECKLIST

DIRECTIONS: Check the column that indicates your present use of instructional processes. Evaluate your responses. What changes in your teaching would you have to make to achieve more effective instruction to assist students in mastering school learning?

Sequences of Planning, Instruction, and Evaluating Processes	Always	Sometimes	Never
Preparation for Mastery Teaching			
1. High achievement is expected of all students by the teacher.			
2. Curricular objectives are sequenced into learning units.			
3. Instructional objectives describe the skills students are to learn.			
4. Instructional objectives include higher thinking skills.			
5. Instructional reading levels of students are determined early in the school year.			
6. Materials are provided to students at their instructional reading levels.			
7. Objectives are specified and tests prepared before instruction begins.			
Instructional Processes			
8. Students have prerequisite skills for the learning of each subsequent skill.			
9. Instruction is provided to groups of students.			
10. Objectives that are clear and uncomplicated are stated for students before instruction is started.			
11. Instruction is geared to the stated objectives.			
12. Skills are modeled as a pattern for students to imitate.			
13. Directives are given for students to replicate the teacher model.			
14. Oral and written responses of students are frequent and at the same rapid rate.			
15. Written models of a dictated item are provided so students can check their own responses.			
16. Positive reinforcement is given to the correct responses of students.			
17. Erroneous responses are corrected by remodeling the skill and by eliciting correct answers.			
18. Corrective procedures are specific and inform students what they are to do.			
19. Corrective procedures are given while students are learning new skills.			
20. Supervised practice time is provided for students to work toward mastery of new skills or concepts.			
21. Students know what they are to accomplish during practice time.			
22. Students know how to work independently to achieve mastery of new skills and concepts.			
23. Small groups of students are also used to motivate and assist students to do corrective work and to increase time to learn new skills.			
24. Practice time includes the testing of students for the mastery of new skills and concepts.			
25. Practice time includes teacher assistance and error correction as needed by the students.			
26. Conference and test data are recorded on students' record forms and used to help plan teaching and learning activities.			
Evaluation of Student Learning			
27. Criterion-referenced tests are designed to assess students' learning of skills.			
28. Criteria for passing mastery tests are the same for all students.			
29. Progress of students in learning new skills and concepts are monitored by using formative tests frequently.			
30. Formative tests are used for diagnostic purposes.			
31. Corrective procedures and sufficient learning activities are provided to help students overcome their errors.			
32. Students are informed about their progress in learning school tasks.			
33. Formative tests are used to determine if instructional procedures need modification.			
34. Summative tests, when used, are administered at the end of a term or course to evaluate students' progress, assign grades, or to make a progress report.			

References

Abrams, J. D. "Mastery Learning in a Smaller School System." Educational Leadership 37 (1979):136-139.

Airasian, P. W. "The Role of Evaluation in Mastery Learning." In Mastery Learning: Theory and Practice, edited by J. Block. New York: Holt, Rinehart and Winston, Inc., 1971.

Airasian, P. W. and Madaus, G. F. "Criterion-Referenced Testing in the Classroom." The National Council on Measurement in Education 3 (1972):1-8.

Ammons, R. "Effects of Knowledge of Performance: A Survey and a Tentative Theoretical Formulation." Journal of General Psychology 54 (1956):279-299.

Anderson, L. W. "An Emperical Investigation of Individual Differences in Time to Learn." Journal of Educational Psychology 68 (1976):223-233.

Ausubel, D. R. and Robinson, F. G. School Learning: An Introduction to Educational Psychology. New York: Holt, Rinehart and Winston, Inc., 1969.

Bandura, A. Principles of Behavior Modification. New York: Holt, Rinehart and Winston, Inc., 1969.

Barber, C. "Training Principles and Teachers for Mastery Learning." Educational Leadership 37 (1979):126-127.

Bijou, S. S., Peterson, R. F., and Marion, H. A. "A Method to Integrate Descriptive and Experimental Field Studies at a Level of Data and Empirical Concepts." Journal of Applied Behavior Analysis 1 (1968):175-191.

Block, J. H., ed. Mastery Learning: Theory and Practice. New York: Holt, Rinehart and Winston, Inc., 1971.

Block, J. H., ed. Schools, Society, and Mastery Learning. New York: Holt, Rinehart and Winston, Inc., 1974.

Block, J. H. "Mastery Learning: The Current State of the Craft." Educational Leadership 37 (1979):114-117.

Block, J. H. and Anderson, L. W. Mastery Learning in Classroom Instruction. New York: Macmillan Publishing Company, Inc., 1975.

Block, J. H. and Burns, R. B. "Mastery Learning." In Review of Research in Education, edited by L. Shulman. Itasca, Illinois: F. E. Peacock, Vol. 4, 1977.

Bloom, B. S., Engelhart, M. D., Furst, E. J., Hill, W. H., and Krathwohl, D. R. Taxonomy of Educational Objectives: The Classification of Educational Goals Handbook I: Cognitive Domain, edited by B. S. Bloom. New York: Longmans, Green and Company, 1956.

Bloom, B. S., Hastings, J. T., and Madaus, G. F. Handbook on Formative and Summative Evaluation of Student Learning. New York: McGraw-Hill Book Company, 1971.

Bloom, B. S. Human Characteristics and School Learning. New York: McGraw-Hill Book Company, 1976.

Bloom, B. S. "New Views of the Learner: Implications for Instruction and Curriculum." Educational Leadership 35 (1978):563-576.

Bloom, B. S. All Our Children Learning. New York: McGraw-Hill Book Company, 1981.

Brandt, R. "On Mastery Learning: An Interview with James H. Block." Educational Leadership 33 (1976):584-589.

Brookover, W. B. and Schneider, J. "Academic Environments and Elementary School Achievement." Journal of Research and Development in Education 9 (1975): 83-91.

Brookover, W. B. and Lezotte, L. W. "Changes in School Characteristics Coincident with Changes in Student Achievement." (Summary Report). East Lansing, Michigan: College of Urban Development, Michigan State University, 1977.

Brookover, W. B., Beady, C., Flood, P., Schweitzer, J., and Wisenbaker, J. School Social Systems and Student Achievement: Schools Can Make a Difference. New York: Praeger Publishers, 1979.

Burns, R. B. "Mastery Learning: Does It Work?" Educational Leadership 37 (1979):110-113.

Carroll, J. B. "A Model of School Learning." Teachers College Record 64 (1963) 723-733.

Chadwick, B. A. and Day, R. C. "Systematic Reinforcement: Academic Performance of Underachieving Students." Journal of Applied Behavioral Analysis 4 (1971):311-319.

Chall, J. S. Learning to Read: The Great Debate. New York: McGraw-Hill Book Company, 1965.

Cooke, L. M. "Why Business Supports Mastery Learning." Educational Leadership 37 (1979):124-125.

Cox, C. H. "Basic Skills Through Mastery Learning: An Interview with Benjamin S. Bloom." Curriculum Review 13 (1979):262-265.

Daines, D. Reading in the Content Areas: Strategies for Teachers. Glenview, Illinois: Scott, Foresman and Company, 1982.

Dechant, E. Diagnosis and Remediation of Reading Disabilities. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1981.

Duchastel, P. C. and Merrill, P. C. "The Effects of Behavioral Objectives on Learning: A Review of Emperical Studies." Review of Educational Research 43 (1973):53-69.

Duchastel, P. C. and Brown, B. R. "Incidental and Relevant Learning with Instructional Objectives." Journal of Educational Psychology 66 (1974): 481-485.

Durkin, D. Teaching Young Children to Read. Boston: Allyn and Bacon, Inc., 1980.

Farr, R. and Brown, V. L. "Evaluation and Decision Making." The Reading Teacher 24 (1971):341-346.

Farr, R. and Roser, N. Teaching a Child to Read. New York: Harcourt Brace Jovanovich, Inc., 1979.

Gagné, R. M. The Conditions of Learning, 3rd ed. New York: Holt, Rinehart and Winston, Inc., 1977.

Gagné, E. D. and Rothkopf, E. Z. "Text Organization and Learning Goals." Journal of Educational Psychology 67 (1975):445-450.

Geisert, G. "SCIP: A New Orleans Solution to a National Problem." Educational Leadership 37 (1979):128-134.

Goodlad, J. L. What Schools are For. Bloomington, Indiana: Phi Delta Kappa, 1979.

Gutherie, J. T. "Feedback and Sentence Learning." Journal of Verbal Learning and Verbal Behavior 10 (1971):23-28.

Hannon, J. P. and Katims, M. "The Chicago Plan: Mastery Learning in the Chicago Public Schools." Educational Leadership 37 (1979):120-122.

Harris, A. J. and Sipay, E. R. How to Increase Reading Ability, 7th ed. New York: Longman Company, 1980.

Hunter, M. Improved Instruction, 9th ed. El Segunda, California: TIP Publications, 1981.

Hyman, J. S. and Cohen, S. A. "Learning for Mastery: Ten Conclusions After 15 Years and 3,000 Schools." Educational Leadership 37 (1979):104-106.

Johnson, M. and Kress, R. The Informal Reading Inventory. Reading Aid Series. Newark, Delaware: International Reading Association, 1965.

Katims, M. "Unsystematic Observations on Success," Educational Leadership 37 (1979):118-123.

Katims, M. and Jones, B. F. "Chicago Mastery Learning Reading: Mastery Learning Instruction and Assessment in Inner City Schools." Paper presented at the annual International Reading Association Conference, New Oreleans, Louisiana, 1981.

Kulik, J., Kulik, C., and Cohen, P. "A Meta-Analysis of Outcome Studies of Keller's Personalized System of Instruction." American Psychologist 34 (1979):307-318.

La Porte, R. E. and Nath, R. "Role of Performance Goals in Prose Learning." Journal of Educational Psychology 68 (1976):260-264.

Levin, T. and Long, R. Effective Instruction. Alexandria, Virginia: Association for Supervision and Curriculum Development, 1981.

Mahan, T. W. and Mahan, A. M. "The Impact of Schools on Learning: Inter-city Children in Suburban Schools." Journal of School Psychology 9 (1971):1-11.

Monroe, M. Children Who Cannot Read. Chicago, Illinois: The University of Chicago Press, 1932.

Naylor, M. J. "Reading Instruction Through Multi-Station Approach." The Reading Teacher 24 (1974):757-761.

Packard, R. G. "The Control of Classroom Attention: A Group Contingency for Complex Behavior." Journal of Applied Behavior Analysis 3 (1970):13-28.

Reid, E. R. "Teacher Behavior Important for Reading Success." Paper presented at the annual meeting of the International Reading Association in New Orleans, Louisiana, 1974.

Reid, E. R. "Another Approach to Mastery Learning." Educational Leadership 38 (1980):170-172.

Reid, E. R. "Comprehension Skills Can Be Taught." Educational Leadership 38 (1981):455-457.

Rosenshine, B. "Content, Time and Direct Instruction." In Research on Teaching: Concepts, Findings, and Implications, edited by P. Peterson and H. Walberg. Berkeley, California: McCutchan, 1979.

Rothkopf, E. Z. and Kaplan, R. "Exploration of the Effect of Density and Specificity of Instructional Objectives on Learning from Text." Journal of Educational Psychology 63 (1972):295-302.

Royer, P. N. "Effects of Specificity and Position of Written Instructional Objectives on Learning from Lecture." Journal of Educational Psychology 69 (1977):40-45.

Rutter, M., Maughan, B., Mortimore, P., Ouston, J., with Smith, A. Fifteen Thousand Hours: Secondary Schools and Their Effects on Children. Cambridge, Massachusetts: Harvard University Press, 1979.

Scheen, D. W. Analysis of Text Materials. Unpublished Master's Thesis. Salt Lake City, Utah: University of Utah, 1972.

Skinner, B. F. "Some Contributions of an Experimental Analysis of Behavior to Psychology as a Whole." American Psychologist 8 (1953):69-78.

Wadham, R. A. "A Multiple Baseline Analysis on the Frequency of Occurrence of Specific Teacher-Pupil Behaviors in a Formal Dictation Exercise." Doctoral Dissertation. Salt Lake City, Utah: University of Utah, 1972.

Wadham, R. A., Young, J. R., and Rencher, A. C. "An Evaluation of Teacher Performance." Provo, Utah: Brigham Young University, 1976.

Winterton, B. The Effect of Oral Response Rates in Learning Grapheme-Phoneme Correspondence. Unpublished Master's Thesis. Salt Lake City, Utah: University of Utah, 1971.

Woodruff, A. D. Psychology of Teaching. New York: Longmans, Green and Company, 1951.